

National Center for Telecommunication Studies
 Transmission Department
 Space Telecommunications Station

Pleumeur-Bodou, 14 August 1963

REPORT ON THE OBSERVATIONS MADE BY THE PLEUMEUR-BODOU
 SPACE TELECOMMUNICATION STATION ON THE VARIOUS
 ORBITAL-POSITIONING PHASES OF SYNCOM II

Observations on the various orbital-positioning phases of Syncom II were made with the Control Tracker of the Pleumeur-Bodou Space Telecommunications Station. Specifically, this tracker permits the acquisition and automatic tracking of all satellites working in the 136 Mc band, and reception of their telemetry transmissions.

The tracker antenna consists of four helicoidal elements located at the corners of 2.80 m x 2.80 m square. The 3 dB aperture of the principal radiation lobe is 18° at 136 Mc. The tracking of Syncom II was possible (when the receiving level became sufficiently high after reorientation of the satellite spin axis) from the apparent rising to the apparent setting of the satellite above the horizon, and down to elevations ranging between -0.5° and -1° because of refraction effects.

The control tracker gives the azimuth and elevation of the satellite at every instant. The accuracy of azimuthal information is approximately one degree. The accuracy of elevation information is also about one degree for elevations higher than 20° . For elevations less than that value, rapid fluctuations of amplitudes greater than one degree can take place without leading to the satellite being off-range for automatic tracking.

Data from These Observations

Beginning with the launch a systematic study was made of the orbital-positioning of Syncom II by determining the position of the satellite by means of the control tracker. A program for the transformation of tracking azimuths and elevations into longitudes and latitudes of the geocentric system permitted the determination of the locus on the Earth's surface of the points on the vertical where the satellite was located during the observations.

The results are shown on the enclosed map and the following comments apply:

The dot-dash line represents the visibility zone limit of Pleumeur-Bodou.

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The control tracker made acquisition of Syncom II for the first time on 26 July 1963 at 1930 hours, five hours after its launch from Cape Canaveral and one-half hour before the firing of the apogee engine. The satellite was at that time at the visibility zone limit of Pleumeur-Bodou and still on its elliptical transfer orbit. The reception level was then -140 dBm, but increased to -130 dBm at 1929 hours; the time of firing of the apogee engine. This firing was observed by the Pleumeur-Bodou observers in the form of very large fluctuations (of about 20 dB) of the reception level, and for three or four minutes. The tracking of Syncom II on its new circular orbit was maintained until 2030 hours (level -120 dBm) and then voluntarily discontinued. The data obtained were sent to NASA at 2030 hours by teletype.

On July 30 and 31 the tracking had to be discontinued (map points α and β) around +1100 hours because of the weakness of the signal received at Pleumeur-Bodou for these positions of the satellite. This was well before the disappearance of the satellite below the horizon. The only possible explanation was the poor orientation of the 136 Mc radiation system with respect to the Earth. As a matter of fact, after August 1 and following the operation for reorientating the spin axis, the signal level remained between -123 and -127 dBm, which made tracking of the satellite possible during the whole visibility period.

Up until August 12, the drift of the figure eight pattern (this pattern is traced on the map by the satellite's passage) was on the average 6°8' westward per day. From August 12 the measurements show that the precession slowed down, but still remained slightly greater than 1° per day. On August 12 the node of the figure eight pattern was at a longitude of about 55° west and close to the position which the NASA technical staff selected for stabilizing the trajectory of Syncom II.

Map Nomenclature

Lieu des positions de Syncom II a 10^H30 VT: Locus of the positions of Syncom II at 1030 Universal Time (UT)

Lancement: Launch 1433 (UT)

Spin dans le plan de l'orbite: Spin in the orbital plane

Apogee: Apogee 1959 UT

Acquisition: Acquisition 19.30

Limite de la zone de visibilité de Pleumeur-Bodou: Visibility zone limit of Pleumeur-Bodou

All dates: for example 26/7/63 change to 7/26/63

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National Center for Telecommunications Studies
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Please mention the
Reference 88/S/3

Issy-Les-Moulineaux, 21 August 1963

Mr. L. Jaffe
Director of Communications Systems
Office of Applications
NASA Headquarters
1520 H Street Northwest
Washington 25, D.C.
U.S.A.

Dear Mr. Jaffe,

Please find enclosed 6 copies of the report on the trajectory tracing observations which were made by the PLEUMEUR-BODOU Station during the orbital-positioning phase of the Syncom II Satellite.

I wish to reiterate my compliments on the perfect success of this operation.

Yours truly,

(signed) R. Sueur
Engineer-General of Telecommunications